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SUGHRUE MION, PLLC				
2100 PENNSYLVANIA AVENUE, N.W.				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/572,956

Applicant(s)

KAKINAMI ET AL.

Examiner

Barry Drennan

Art Unit

2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 1/28/2009, 3/17/2009, and 3/31/2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 12-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SI/08)
Paper No(s)/Mail Date 1/28/2009
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. The amendment filed 28 January 2009 was noncompliant and was therefore not entered. The amendment filed 17 March 2009 has been entered. The supplemental amendment filed 31 March 2009, cancelling claims 1-11 and adding claims 12-22, has been entered.

Examiner notes that entry of supplemental replies is not a matter of right under 37 CFR 1.111(a)(2) except under certain conditions that are not present in this case. However, in this case, the amendments made in the supplemental reply take into account a discussion during an interview pertaining to related copending application 10/572,957 concerning similar rejections made in that application under 35 U.S.C. 101 and 112, 2nd paragraph. The amendments are limited to remedying those rejections in accordance with the discussion in the related application. The supplemental amendment has therefore been entered.

Examiner also notes that while the amendments to the claims filed 28 January 2009 were noncompliant and therefore not entered, the arguments offered by Applicant at that time have been considered in the drafting of this Office action.

Finally, Examiner notes that there were minor changes to the claims made in the amendment filed 17 March 2009 which were reverted in the supplemental amendment filed 31 March 2009. For example, in claim 12 (corresponding to claim 1 as presented earlier), in the phrase "to define a position of one curve as an innermost marking line",

the underlined portion had been added in claim 1 of the 17 March 2009 amendment, but was omitted from claim 12 of the 31 March 2009 amendment.

Response to Arguments

2. Applicant has amended the title in response to the objection to the specification for the title being insufficiently descriptive. The objection to the specification on this basis is therefore withdrawn.

3. Applicant has amended the claims, cancelling claims 1-11 and presenting new claims 12-22 of similar form to claims 1-11, respectively, in response to the rejections of claims 1-11 under 35 U.S.C. 101 as being directed to nonstatutory subject matter.

As amended, the claims recite an apparatus including "image pickup means". When read in light of the specification, the "image pickup means" clearly refers to a physical device such as a camera. Therefore, the apparatus is not purely composed of software elements, and is thus not merely functional descriptive material.

The rejections of claims 1-11 under 35 U.S.C. 101 are moot by virtue of their cancellation, and no rejection of claims 12-22 under 35 U.S.C. 101 is being presented at this time, in accordance with the discussion above.

4. Applicant has amended the claims, cancelling claims 1-11 and presenting new claims 12-22 of similar form to claims 1-11, respectively, in response to the rejections of claims 1 and 8 under 35 U.S.C. 112, second paragraph, as being indefinite.

As previously presented, the claims recited various elements appearing to invoke 35 U.S.C. 112, sixth paragraph, by using the phrase "means for" on several occasions, followed by functional and not structural language. However, the presence of supporting physical structure in the specification was unclear, because at least some embodiments were implementable purely as software, which is not physical structure; hence, the claims were rendered indefinite. In the amended claims, the phrase "section for" appears instead. Examiner therefore construes the claims as not invoking 35 U.S.C. 112, sixth paragraph; since the claims now do not require the specification to include a recitation of physical structure corresponding to the claims, the previous indefiniteness has been remedied.

The rejections of claims 1 and 8 under 35 U.S.C. 112, second paragraph, are moot by virtue of their cancellation, and no rejection of claims 12 and 19 under 35 U.S.C. 112, second paragraph, is being presented at this time, in accordance with the discussion above.

5. Applicant has argued, in response to the rejections of claims 1 and 8 under 35 U.S.C. 102(b) as being anticipated by Otsuka et al., U.S. Patent Application Publication 2003/0103650 A1 (published 5 June 2003, hereinafter **Otsuka**), that Otsuka does not teach every element of claims 1 and 8.

In particular, Applicant argues that the limitations of "to define [a position of one curve as] an innermost marking line" and "[to] define a position of a neighboring curve... as a position of a boundary of said traveling lane" are not disclosed by Otsuka,

inasmuch as Otsuka does not disclose defining a neighboring curve as the lane boundary based on a curve identified as the innermost marking line.

Examiner respectfully disagrees. As set forth in the previous rejection, the curve **#62 (in Fig. 6; or #61, depending on which side of the lane the line appears on)** defines an innermost marking line, i.e., the innermost edge of the lane marking line; Otsuka then produces the curve **#63**, which neighbors curve **#62 (or #61)** and is outside of that curve relative to the center of the lane, and defines it as a position of a boundary of said traveling lane (i.e., the location of the lane marker itself, which naturally divides the pavement into lanes and is therefore the lane boundary).

While the rejections of claims 1 and 8 are moot by virtue of the cancellation of those claims, the newly presented claims 12 and 19 correspond to the earlier presented claims. Accordingly, rejections of claims 12 and 19, similar to those of 1 and 8 in the prior Office action, under 35 U.S.C. 102(b) as being anticipated by Otsuka are presented below.

6. Applicant has argued that claims 13-18 and 20-22 (or, 2-7 and 9-11 before the supplemental amendment) are allowable at least by virtue of their dependency upon an allowable claim. This argument is moot in view of the discussion above. Rejections of claims 13-18 and 20-22, similar to those of 2-7 and 9-11, against the prior art are presented below.

7. Following is a statement of all objections and rejections pending in the application.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 12-16, 19, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Otsuka et al., U.S. Patent Application Publication 2003/0103650 A1 (published 5 June 2003, hereinafter **Otsuka**).

10. With respect to claim 12, Otsuka discloses:

A device for detecting a road traveling lane, comprising:

image pickup means that continuously picks up images on a road surface (**Fig.**

10 #104);

edge point detection section for detecting a plurality of edge points in a contour on the image (**paragraph 38, "...data representing each of the edge points includes position information x and y..." and Fig. 3 #4**);

segment group producing section for providing a line segment for the plurality of edge points detected by said edge point detection section (**Fig. 3 #5**), on the basis of continuity of distance and direction (**paragraph 44, "These edges are paired up with each other..."**) between neighboring edge points, and grouping a plurality of line

segments having a predetermined relationship with each other (**paragraph 44**), to produce a segment group;

curve detection section for detecting a curve fitted to the segment group produced by said segment group producing section (**paragraph 45, “straight lines of the left and right lane markers are estimated based on the distribution of edge points having angles of θ -l and θ -r”**); and

lane boundary position defining section for comparing a plurality of curves distributed in the vicinity of right and left lane boundaries out of the curves detected by said curve detection section (**paragraph 46, “From two straight lines obtained through these procedures, a centerline is obtained and designated as the left white line,”**) with the segment groups produced by said segment group producing section, to define an innermost marking line (**Fig. 6 #62 or #61, depending on which side of the road the detected edges are positioned toward**), when a segment group forming a curve closest to the center of said traveling lane has a predetermined length and repeated cycle (**as shown in the segments of #62 in Fig. 6**), and define a position of a neighboring curve outside of said innermost marking line relatively to the center of said traveling lane, as a position of a boundary of said traveling lane (**Fig. 6 #63**).

11. With respect to claim 13, Otsuka discloses:

A device for detecting a road traveling lane as described in claim 1, wherein said segment group producing section produces said segment group for a group including a predetermined line segment and another line segment provided in an area of the

predetermined distance and direction relative to the predetermined line segments in said plurality of line segment (**paragraph 44, as above; Fig. 3 #5; Fig. 6**).

12. With respect to claim 14, Otsuka discloses:

A device for detecting a road traveling lane as described in claim 1, wherein said segment group producing section provides said line segment for a group of edge points including the plurality of edge points detected by said edge point detection section, on the basis of continuity of distance and direction between neighboring edge points (**paragraph 44, as above**).

13. With respect to claim 15, Otsuka discloses:

A device for detecting a road traveling lane as described in claim 1, wherein said segment group producing section determines that there is a predetermined relationship, to be processed as one group, when there is another line segment in an area of the predetermined distance and direction relative to a predetermined line segment, in a group of line segments based on said plurality of line segments (**Fig. 6 #62 or #61**).

14. With respect to claim 16, Otsuka discloses:

A device for detecting a road traveling lane as described in claim 1, wherein said curve detection section applies a curve-fitting to the grouped line segments, to detect said curve (**paragraph 46, “Least squares approximation or the like may be used...” and as above; Fig. 6 #63**).

15. With respect to claim 19, Otsuka discloses:

A device for detecting a road traveling lane, comprising:

image pickup means that continuously picks up images on a road surface (**Fig. 10 #104**);

edge point detection section for detecting a plurality of edge points from a contour on the images (**paragraph 38, as above; Fig. 3 #4**);

curve detection section for detecting curves fitted to the plurality of edge points detected by said edge point detection section (**paragraph 45, as above**);

segment group producing section for grouping groups of edge points contributed to the curves detected by said curve detection section, to produce segment groups (**paragraph 44, as above; Fig. 3 #5**); and

lane boundary position defining section for comparing a plurality of curves distributed in the vicinity of right and left lane boundaries out of the curves detected by said curve detection section (**paragraph 46, as above**), with the segment groups produced by said segment group producing section, to define an innermost marking line (**Fig. 6 #62 or #61**), when a segment group produced for a curve closest to a center of said traveling lane indicates a predetermined length and repeated cycle, and define a position of a neighboring curve outside of said innermost marking line relatively to the center of said traveling lane, as a position of a boundary of said traveling lane (**Fig. 6 #63**).

16. With respect to claim 20, Otsuka discloses:

A device for detecting a road traveling lane as described in claim 8, wherein said segment group producing section provides an edge histogram for the groups of edge points provided for the curves detected by said curve detection section, and groups the groups of edge points contributed to peaks of said histogram, to produce segment groups (**paragraph 44, “[P]eaks appear for certain particular edge angles. A histogram is therefore created,” and Fig. 5B).**

Claim Rejections - 35 USC § 103

17. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

18. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Otsuka as applied to claim 12 above, and further in view of Ohta, U.S. Patent Application Publication 2002/0159616 A1 (published 31 October 2002, hereinafter **Ohta**).

19. With respect to claim 17, Otsuka discloses the determination of whether line segments have a predetermined length and cycle (**implicitly by virtue of the presence of shorter peaks than those for solid lines in the generated histogram, paragraph 44 and Fig. 5B**), but does not disclose using this determination in removing those segments from consideration when finding road edge markings.

However, Ohta discloses detecting a wide variety of road markings and removing those from an image when detecting other objects (**paragraph 107 and Fig. 8**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the road edge detection system of Otsuka with the road marking removal system of Ohta, motivated by the need to remove spurious signals from consideration when attempting to find target objects (**Ohta, paragraph 16**).

20. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Otsuka as applied to claim 20 above, and further in view of Ohta.

21. With respect to claim 21, Otsuka discloses the determination of whether line segments have a predetermined length and cycle via histogram (**implicitly by virtue of the presence of shorter peaks than those for solid lines in the generated histogram, paragraph 44 and Fig. 5B**), but does not disclose using this determination in removing those segments from consideration when finding road edge markings.

However, Ohta discloses detecting a wide variety of road markings and removing those from an image when detecting other objects (**paragraph 107 and Fig. 8**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the road edge detection system of Otsuka with the road marking removal system of Ohta, motivated by the need to remove spurious signals from consideration when attempting to find target objects (**Ohta, paragraph 16**).

22. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Otsuka as applied to claim 12 above, and further in view of Kakinami et al., U.S. Patent 5,991,427 (issued 23 November 1999, hereinafter **Kakinami**).

23. With respect to claim 18, Otsuka discloses the detection of edge points in the image in projected-space coordinates, but does not disclose transforming those coordinates back into 3-d space.

However, Kakinami discloses detecting edge points and then transforming those edge points from projected space back into 3-d space (**Fig. 5 #102, 104, 105**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the road edge detection system of Otsuka with the coordinate transformation of Kakinami, motivated by the simplified calculations (parallel road lines converge toward a distant point of convergence in projected space, but are truly parallel in 3-d space) and additional potential uses (reconstruction of 3-d scenes with the collected data) once the edge points are transformed back into 3-d space.

24. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Otsuka as applied to claim 19 above, and further in view of Kakinami.

25. With respect to claim 22, Otsuka discloses the detection of edge points in the image in projected-space coordinates, but does not disclose transforming those coordinates back into 3-d space.

However, Kakinami discloses detecting edge points and then transforming those edge points from projected space back into 3-d space (**Fig. 5 #102, 104, 105**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the road edge detection system of Otsuka with the coordinate transformation of Kakinami, motivated by the simplified calculations (parallel road lines converge toward a distant point of convergence in projected space, but are truly parallel in 3-d space) and additional potential uses (reconstruction of 3-d scenes with the collected data) once the edge points are transformed back into 3-d space.

Conclusion

26. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Barry Drennan whose telephone number is 571-270-7262. The examiner can normally be reached on Monday through Thursday, 9am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Werner can be reached on 571-272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Barry Drennan/
Examiner, Art Unit 2624

/Brian P. Werner/
Supervisory Patent Examiner, Art Unit 2624

